AMENDMENTS TO THE CLAIMS

A

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (currently amended) A method for detecting an endpoint of a chemical mechanical planarization (CMP) process comprising the steps of:

providing a light pulse on an area of a surface of a semiconductor wafer;

receiving light reflected from said area of said surface and obtaining a measurement of said reflected light;

tracking a location of said area from which said measurement is obtained;

analyzing a reflectance spectra associated with said measurement and said location of said area from which said measurement was obtained;

repeating said steps listed hereinabove until an intermediate reflectance spectra is identified that has a sinusoidal shape when normalized; and

adjusting a parameter of the CMP process corresponding to said area relative to another area of said semiconductor wafer based on an analysis of said reflectance spectra and said location associated therewith.

2. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 1 further comprising the steps of:

identifying a change in said reflectance spectra corresponding to a layer of material being removed from said surface by the chemical mechanical planarization process and an underlying layer of a different material being exposed; and

stopping the chemical mechanical planarization process.

3. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 2 wherein said step of identifying a change in said reflectance spectra corresponding to a layer of material being removed from said surface by the chemical mechanical planarization process and an underlying layer of a different material being exposed further comprises a step of overpolishing for a predetermined time period to ensure said layer of material is removed.

4. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 1 further comprising the steps of:

continuing the chemical mechanical planarization process for a predetermined time period; and

stopping the chemical mechanical planarization process after said predetermined time period.

5. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 1 wherein said step of providing a light pulse on an area of a surface of a semiconductor wafer further comprises the step of using a broadband spectrum of light such that an intensity of said reflected light is analyzed over a plurality of wavelengths.

6. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 5 wherein said step

of using a broadband spectrum of light such that an intensity of said reflected light is analyzed over a plurality of wavelengths further comprises a step of providing light in a range of 300 to 800 nanometers in wavelength.

7. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 1 wherein said step of analyzing a reflectance spectra further comprises a step of performing a fast fourier transform analysis on said reflectance spectra.

8. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 1 wherein said step of repeating said steps listed hereinabove until an intermediate reflectance spectra is identified that has a sinusoidal shape when normalized further comprises the steps of :

varying a location of said light pulse on said surface of said wafer; and

taking a diversity of reflectance spectra over time such that an entire surface of said semiconductor wafer is represented by said measurements in determining material uniformity, thickness, and removal rate.

9. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 1 wherein said step of providing a light pulse on an area of a surface of a semiconductor wafer further comprises a step of providing said light pulse for a time period of approximately ten microseconds or less.

10. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 1 wherein said step of providing a light pulse on an area of a surface of a semiconductor wafer further comprises a step of providing said light pulse having a spot size larger than a largest feature size to remain on said semiconductor wafer after the CMP process.

11. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 1 wherein said step of providing a light pulse on an area of a surface of a semiconductor wafer further comprises a step of using more than one probe to pulse and receive light.

12. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 11 wherein said step of using more than one probe to pulse and receive light further comprises the steps of:

using more than one probe to pulse and receive light such that each probe measures a concentric band on said surface and said concentric bands measured by each probe combine to represent an entire surface of said semiconductor wafer; and

overlapping measurements of each probe to an adjacent concentric band.

13. (currently amended) A method for detecting an endpoint of a chemical mechanical planarization (CMP) process comprising the steps of:

taking reflectance spectra data periodically on different areas of a surface of a semiconductor wafer during the CMP process and tracking a location of each of said different areas from which said reflectance spectra is taken;

identifying a first reflectance spectra corresponding to a first layer of material on at least one of said different areas of said surface of said semiconductor wafer such that said first reflectance spectra comprises light reflected predominately from said first layer of material;

identifying a second reflectance spectra corresponding to said first layer of material on said surface being thinned such that said second reflectance spectra is modified by a second layer of material underlying said first layer of material;

identifying a third reflectance spectra corresponding to said first layer of material on said surface being substantially removed such that said third reflectance spectra comprises light reflected predominately from said second layer of material; and

adjusting a parameter of the CMP process corresponding to said at least one of said different areas relative to another of said different areas based on an analysis of said reflectance spectra and said location associated therewith.

14. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 13 wherein said step of taking reflectance spectra data periodically on different areas of a surface of a semiconductor wafer during the CMP process further comprises a step of using a broadband spectrum of light ranging from 300 to 800 nanometers in wavelength to generate said reflectance spectra data.

15. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 13 further comprising the steps of:

normalizing said reflectance spectra data to said first reflectance spectra; and

identifying when said normalized reflectance spectra data changes from an approximately linear shape to an approximately sinusoidal shape that corresponds to said second reflectance spectra.

16. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 15 further comprising the steps of:

continuing the CMP process for a predetermined time period; and

ending the CMP process after said predetermined time period.

17. (previously presented) The method for detecting an endpoint of a chemical mechanical planarization (CMP) process as recited in claim 15 further comprising the steps of:

identifying when said normalized reflectance spectra data changes from said approximately sinusoidal shape to an approximately linear shape that corresponds to said third reflectance spectra data;

overpolishing for a predetermined time period; and

ending the CMP process after said predetermined time period.

18. (currently amended) A method of wafer processing including end point detection for a chemical mechanical planarization process (CMP) comprising the steps of:

forming at least one trench in a dielectric layer of a semiconductor wafer;

depositing a barrier material on a surface of said semiconductor wafer such that said barrier material forms a layer on a bottom and sidewalls of said at least one trench;

depositing copper on said surface of the semiconductor wafer such that said at least one trench is filled with copper;

performing a first CMP process to remove a layer of copper on said surface of the semiconductor wafer such that said copper remains in said at least one trench;

initiating a second CMP process to remove said layer of barrier material on said surface of the semiconductor wafer;

taking reflectance spectra data on different areas of said surface of said semiconductor wafer using a broadband spectrum of light ranging from 300 nanometers to 800 nanometers in wavelength and tracking the locations of said different areas from which said reflectance spectra data is taken;

identifying when said reflectance spectra data taken from said locations is modified by said dielectric layer underlying said barrier material to assess when said barrier material has been thinned at said locations; and

adjusting a parameter of said second CMP process corresponding to a first area of said different areas of said semiconductor wafer relative to a second area and continuing with said second CMP process knowing an approximate thickness of said barrier material that remains.

19. (previously presented) The method of claim 18 further comprising the steps of:

identifying when said reflectance spectra data corresponds to reflected light predominately from said dielectric layer; and

overpolishing to ensure complete removal of said barrier material on said surface of the semiconductor wafer.

20. (previously presented) The method of claim 18 wherein said step of depositing a barrier material on a surface of a semiconductor wafer such that said barrier material forms a layer on a bottom and sidewalls of said at least one trench further comprises a step of depositing tantalum or tantalum nitride as said barrier material.

21. (cancelled)